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ORIGINAL ARTICLE

Profile of tuberculosis mortality in Brazil, 2001-2011

Perfil da mortalidade por tuberculose no Brasil, 2001-2011

Perfil de la mortalidad por tuberculosis en Brasil, 2001-2011

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ABSTRACT

Rationale: In the health-disease process of tuberculosis (TB), mortality is one of the health indicators that most reflects the social link with the biological aspect. Death from TB is a sentinel event because it is preventable and indicates a failure of the social network and the health system. **Objectives:** To describe the sociodemographic and operational characteristics of patients who died of TB and the temporal distribution of the TB mortality rate in Brazil. **Methods:** A descriptive, cross-sectional, quantitative study performed from the database of the Mortality Information System (Portuguese acronym: SIM), in which all deaths with TB as the main cause registered from 2001 to 2011 were considered. Data analyzed through descriptive statistics. **Results:** During the study period, 53,747 deaths were recorded with TB as the basic cause. There was a higher percentage of cases of male sex (n = 39,597; 73.6%), mixed race (n=21,697; 40.3%), single marital status (n=23,518; 43.8%), schooling of up to eight years (n=19,443; 36.2%). A higher number of deaths occurred at the hospital (n=43,028; 80.1%) and 19,712 cases (36.7%) received medical assistance before death. The annual crude mortality rate decreased during the study period, ranging from 3.2 to 2.4 deaths per 100 thousand inhabitants. **Conclusion:** The results show the need for strategies differentiated by sex, age and education at the local level in TB control programs, as well as for planning health promotion and prevention actions available to populations living in these areas.
Descriptors: Tuberculosis, Mortality, Information Systems, Observational study, Health Profile.

RESUMO

Justificativa: No processo saúde-doença da tuberculose (TB), a mortalidade constitui um dos indicadores de saúde que mais traduz o enlace social com o biológico. O óbito por TB é considerado um evento sentinela por ser evitável, indicativo de falha da rede social e do sistema de saúde. **Objetivos:** Descrever as características sociodemográficas e operacionais dos pacientes que evoluíram a óbito por TB e a distribuição temporal da taxa de mortalidade por TB no Brasil. Métodos: Estudo descritivo do tipo transversal e abordagem quantitativa, realizado a partir do banco de dados do Sistema de Informação sobre Mortalidade (SIM), na qual foram considerados todos os óbitos que apresentaram a TB como causa básica, registrados de 2001 a 2011, analisados por meio da estatística descritiva.

Resultados: No período do estudo, foram registrados 53.747 óbitos com TB como causa básica, sendo maior percentual dos casos do sexo masculino (n= 39.597; 73,6%), raça/cor parda (n= 21.697; 40,3%), estado civil solteiro (n= 23.518; 43,8%), escolaridade até 8 anos de estudo (n=19.443; 36,2%), maior ocorrência dos óbitos no hospital (n= 43.028; 80,1%) e 19.712 casos (36,7%) receberam assistência médica antes do óbito. As taxas brutas anuais de mortalidade apresentaram redução no período de estudo, variando de 3,2 a 2,4 óbitos por 100 mil habitantes. **Conclusão:** Os resultados evidenciam a necessidade de propor estratégias diferenciadas por sexo, idade e escolaridade em nível local nos programas de controle de TB, assim como planejamento de ações de promoção e prevenção da saúde disponíveis às populações residentes nessas áreas.

Descritores: Tuberculose, Mortalidade, Sistemas de Informação, Estudo observacional, Perfil de Saúde.

RESUMEN

Justificación: En el proceso salud-enfermedad de la tuberculosis (TB), la mortalidad es uno de los indicadores de salud que más refleja el vínculo social con el biológico. La muerte por TB se considera un evento centinela porque es prevenible, lo que indica un fallo de la red social y el sistema de salud. **Objetivos:** Describir las características sociodemográficas y operativas de los pacientes fallecidos por TB y la distribución temporal de la tasa de mortalidad por TB en Brasil. **Métodos:** un estudio descriptivo, de corte transversal y cuantitativo, realizado a partir de la base de datos del Sistema de Información de Mortalidad (SIM), en el cual se consideraron todas las muertes que presentaron TB como causa básica, registradas desde 2001 hasta 2011. Los datos fueron analizados mediante estadística descriptiva. **Resultados:** Durante el período de estudio, se registraron 53,747 muertes con TB como la causa básica. Hubo un mayor porcentaje de casos de sexo masculino (n=39,597; 73.6%), raza mixta (n=21,697; 40.3%), estado civil soltero (n=23,518; 43.8%), escolaridad de hasta ocho años (n=19,443; 36.2%). Un mayor número de muertes ocurrieron en el hospital (n=43,028; 80,1%) y 19,712 casos (36.7%) recibieron asistencia médica antes de la muerte. La tasa de mortalidad bruta anual disminuyó durante el período de estudio, oscilando desde 3.2 a 2.4 muertes por cada 100 mil habitantes. **Conclusión:** Los resultados muestran la necesidad de estrategias diferenciadas por sexo, edad y educación a nivel local en los programas de control de la TB, así como la planificación de acciones de promoción y prevención de la salud disponibles para las poblaciones que viven en estas áreas.

Descriptores: Tuberculosis, Mortalidad, Sistemas de Información, Estudio observacional, Perfil de Salud.

INTRODUCTION

Tuberculosis (TB) is the leading cause of death from infectious diseases among adults around the world and still shows alarming numbers. It is estimated that in 2017, 1.3 million people died of TB worldwide.[1] In the same year, the mortality coefficient was of 2.2/100 thousand inhabitants in Brazil, with a reduction trend and an average annual drop of 2.1%, in the period from 2008 to 2017. Considering the continental dimensions of a country like Brazil, some states have presented a mortality coefficient higher than that registered in the country, such as Pernambuco (4.5/100 thousand inhabitants), Rio de Janeiro (4.1/100 thousand inhabitants), Amazonas (3.9/100 thousand inhabitants) and Pará (3.1/100 thousand inhabitants).[2]

In Brazil, the Death Certificate (DC) is the source of research to verify mortality data. In addition to the legal function, the Mortality Information System (Portuguese acronym: SIM) is extremely important to organize, plan and execute health actions in the country with a view to their improvement. Direct data from the SIM currently have great potential for use in studies of deaths, given the systematic monitoring of the occurrence of the event. The TB mortality coefficient is one of the main indicators used for monitoring and evaluating TB control actions from diagnosis to treatment. It is also the basis for the analysis of trends, indication of priorities and evaluation of programs.[3]

Studies that deal with the quality of SIM data have been conducted for understanding the dynamics of TB mortality, essential for planning, monitoring, executing and evaluating health actions.[4,5] However, there is a deficiency in studies aimed at assessing the quality of data specifically related to TB.[6] Thus, the objective of this study was to describe the sociodemographic and operational characteristics of patients who died of TB and the temporal distribution of the TB mortality rate in Brazil.

METHODS

This is a descriptive, cross-sectional, quantitative study with retrospective analysis of secondary data. The study was conducted with records of TB deaths in Brazil from 2001 to 2011.

The study population was composed of the total number of deaths of people residing in Brazil in the period and area of the study, in which TB was registered as the basic cause of death in the DC. The clinical presentations of TB were coded according to the 10th version of the International Classification of Diseases (ICD-10): pulmonary TB: A150 - A153, A160 - A162 and A169; Extrapulmonary respiratory TB: A154 - A159 and A163 - A168; Extrapulmonary TB: A170 - A179; TB of other organs: A180-A189; Miliary TB: A190 - A199.

The source of data was the Mortality Information System (SIM - SVS/Ministry of Health), which is public domain and accessed through the Ministry of Health website (DATASUS). Since there is no identification of cases in this database, there is no risk of personal characterization of individuals. Population data were extracted from census data for the year 2010 and the population projections for

inter-census years were acquired on the website of the Brazilian Institute of Geography and Statistics (IBGE).

The variables of interest were obtained in the respective items of the DC and comprise sociodemographic characteristics (sex, age group, race/color, marital status and educational level) and operational characteristics (basic cause of death, place of death, medical assistance before the occurrence, autopsy to confirm the diagnosis and information about the person who signed the death certificate).

Descriptive analysis was performed according to sociodemographic and operational variables presented in a table. For the age variable (quantitative, continuous), measures of position (mean, median, minimum and maximum values) and dispersion (Standard Deviation - SD) were calculated. The age variable was transformed into a qualitative variable when establishing ranges of every 19 years. For the age group variable and the other variables (qualitative), absolute and relative frequencies were calculated.

The formula used for the calculation of TB mortality rate was: TB mortality rate = [number of deaths from TB x 100 thousand] / Brazilian population.

Analyzes of the evolution of TB mortality rates were performed according to sex and age group, based on graphs (figures) for observing the variation in the number of deaths from TB per year in Brazil. Data were analyzed using the Stata statistical software, version 13.0 (Stata Corp., College Station, TX, EUA).

The study was sent to the Research Ethics Committee of the Escola de Enfermagem Anna Nery – EEAN/UFRJ – Hospital Escola São Francisco de Assis (CEPEEA-NHESFA) and approved under numbers 1.056.567 and CAAE: 43487214.6.0000.5238.

RESULTS

In the period from January 2001 to December 2011, 11,544,594 deaths were registered in the SIM of Brazil, out of which 53,747 (0.46%) presented TB as the basic cause of death.

The average age of individuals who died of TB in the analyzed period was 53 years (±18). There was a predominance of deaths in higher age groups, of 40 to 59 years old (40.1%) and over 60 years old (37.1%). The highest percentage of deaths occurred in the male group (n=39,597; 73.6%), mixed race (n=21,697; 40.3%), single marital status (n=23,518; 43.8%). As for educational level, a higher mortality from TB was the basic cause in individuals with up to eight years of study (n=19,443; 36.2%) (Table 1).

Considering the operational variables, the highest proportion of deaths occurred in the hospital (n=43,028; 80.1%), 19,712 cases (36.7%) received medical assistance before death, and in 32,343 (60, 2%) records, this information was unavailable. As for the person responsible for the record, the majority was performed by the doctor who filled out the DC (n=18,824; 35.0%). Furthermore, the highest percentage of deaths (n=29,336; 54.6%) did not undergo an autopsy to confirm the diagnosis and in 16,925 (31.5%) cases, this information was in blank or unavailable (Table 1).

Table 1. Sociodemographic and operational characteristics of deaths from TB, Brazil, 2001-2011.

Variables	n	%
Sex		
Male	39,597	73.6
Female	14,135	26.3
Ignored	16	0.1
Age range		
0 – 19 years	1,288	2.4
20 – 39 years	10,341	19.2
40 – 59 years	21,540	40.1
> 60 years	19,925	37.1
Blank	654	1.2
Race/color		
White	19,358	36.0
Black	7,355	13.7
Others	738	1.4
Mixed race	21,697	40.3
Blank	4,600	8.6
Schooling		
No schooling	296	0.6
Up to eight years of study	19,443	36.2
More than eight years of study	14,052	26.1
Ignored	11,526	21.4
Blank	8,431	15.7
Marital status		
Single	23,518	43.8
Married	16,271	30.3
Widowed	5,647	10.5
Judicially separated	2,212	4.1
Common-law marriage	494	0.9
Ignored	3,083	5.7
Blank	2523	4.7
Place of death		
Hospital	43,028	80.1
Other health facilities	1,589	3.0
Domicile	7,540	14.0
Public space	651	1.2
Others	801	1.5
Ignored	138	0.2
Medical assistance		
Yes	19,712	36.7
No	1,692	3.1
Ignored	4,633	8.6
Blank	27,710	51.6
Autopsy		
Yes	7,486	13.9
No	29,336	54.6
Ignored	2,689	5.0
Blank	14,236	26.5
Death certified by a doctor		
Doctor who completed the DC	18,824	35.0
Substitute doctor	14,744	27.4
Foresinc Medicine Institute	2,576	4.8
Death verification servisse	5,763	10.7
Others	6,921	12.9
Blank	4,919	9.2

Over the study period, pulmonary TB was predominant in about 47,486 cases (90%) out of the total deaths from TB (Figure 1).
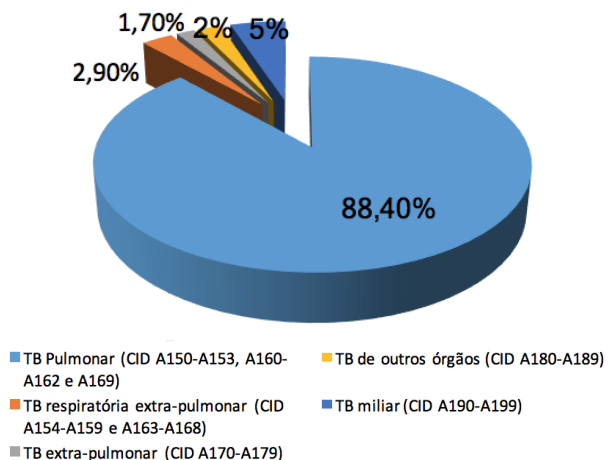

Figure 1. Distribution of deaths from TB and the registered ICD-10, Brazil, 2001-2011.

Considering the annual TB mortality rates (all forms) (Figure 2), there is a general reduction trend, ranging from 3.2 to 2.4 deaths per 100 thousand inhabitants, while the general TB mortality rate for the period was 2.7 per 100 thousand inhabitants. During this period, there were small fluctuations, although in general, the occurrence of deaths from TB has decreased. As for deaths from pulmonary TB, they accounted for 88.7% of total deaths in 2001, and for 73.7% in 2011. This proportion has not changed significantly over the years studied.

In 2001, the southeast and north regions had higher rates than those of Brazil. In 2011, in addition to the southeast and north, the northeast region also had a high rate of mortality from TB. For all regions, the rates for 2011 were lower than those for 2001. In the southeast (33%) and central west (30%) regions, this reduction was more pronounced than in the other regions (Figure 3).

There was a lower percentage of cases in individuals up to 19 years of age, as well as a decreased contribution of individuals aged 20 to 39 years. On the other hand, the proportions of the age group between 40 and 59 years were maintained and there was an increase in the number of deaths from TB among groups of 60 years of age
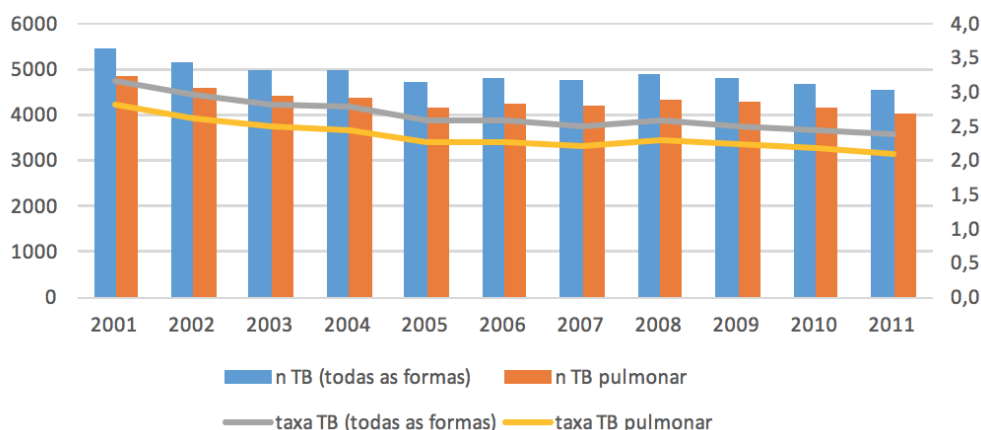

Figure 2. Number of deaths and TB mortality rate (per 100 thousand inhabitants) for all clinical and pulmonary forms, Brazil, 2001-2011.
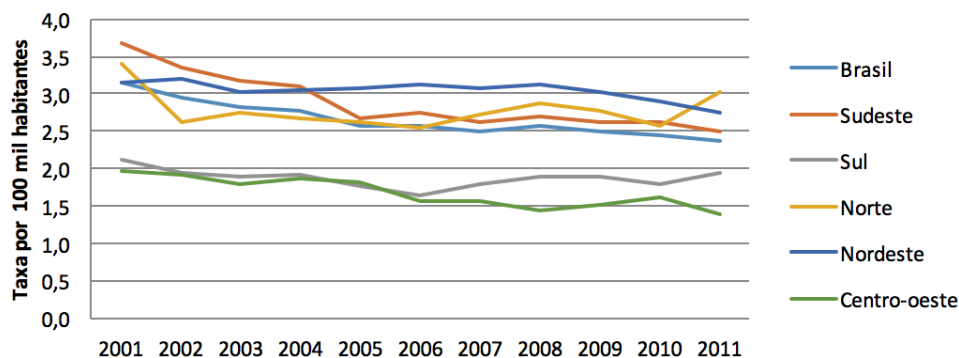

Figure 3. Annual TB mortality rates per 100 thousand inhabitants by region, Brazil, 2001-2011.
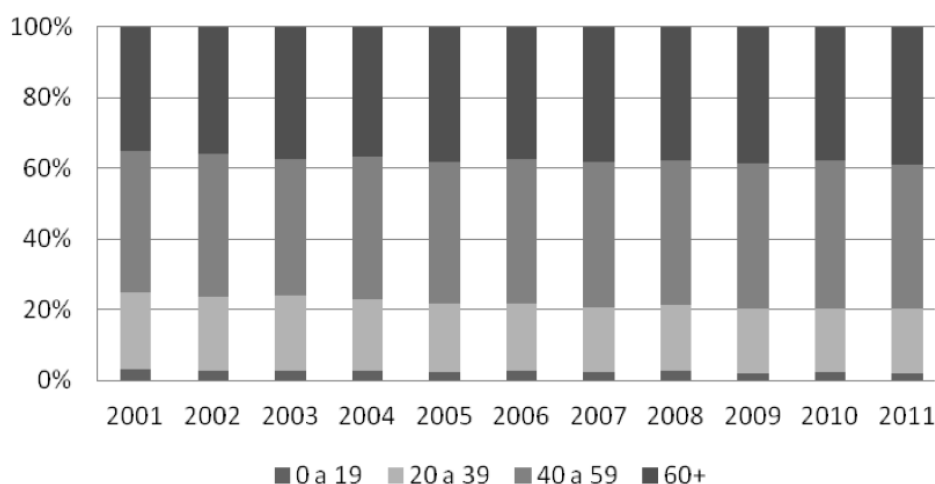
Figure 4. Proportional mortality of deaths from TB by age group, Brazil, 2001-2011.

or more. In 2011, of the total deaths from TB with known age, 38.4% occurred in individuals aged 60 years or older, and in 2001, the proportion in that same age group was of 34.7% (Figure 4).

The temporal evolution of annual TB mortality rates according to sex demonstrated that regardless of the years under study, the male sex rates were higher (more than twice) than those observed for females, and they increased from year 2001 (2.7 times) to 2011 (3.3 times). The female contribution over the years did not exceed 28%, therefore, men presented a higher mortality rate from TB.

DISCUSSION

Mortality data are essential for the development of health policies. Statistics on causes of death are the most traditional and at the same time, one of the most important information for the health sector.[3] Considering the profile of individuals who died from TB, most cases occurred among male individuals, over 40 years of age, mixed race, single marital status and with schooling of up to eight years. Regarding operational variables, the highest proportion of deaths occurred in health facilities and there was medical assistance before death. The fact that less than 15% of cases underwent autopsy to confirm the diagnosis drew attention.

The analysis of the profile of TB mortality in Brazil according to sex revealed a higher occurrence of deaths among male individuals. This fact is observed in countless other studies that indicate a higher percentage of deaths in the male population.[7,8] Possibly, this profile is a consequence of the longer time that men take to seek health services and their resistance to attend these services, often looking for care only when pain becomes unbearable or when it is impossible to work.[9] This fact tends to delay the diagnosis and consequent initiation of treatment, in addition to differences in other exposure factors (higher prevalence of HIV infection, alcoholism and drug abuse).[10]

Regarding age, in the present study, there was a predominance of cases among those over 40 years (mean age of 53 years ± 18), corroborating with other studies. In Brazil, the proportions of the 40-59 years old group were maintained and there was an increase in deaths among groups aged 60 and over.[11] In 2004, in Brazil, 56.1% of the total deaths with known age occurred in individuals aged 50 or over, in contrast to 45.1% in 1980.[11,4] Studies point to an increasing risk for death from TB in the elderly (>60 years) and this fact is attributed to the aging population, deficient immune response, presence of comorbidities and the influence of control programs.[12,13]

The greater risk found among the elderly can be explained by lower immunity, difficulty in accessing health services, elderly people confined to long-term care facilities, non-specific clinical presentation, side effects of treatment, often unknown history of contact with TB, frequent lack of consideration of the disease at these extremes of age, and when the diagnosis is considered, the disease progression may already be advanced. Mortality in this group is higher than in the general population that had TB.[14]

For all these reasons, the following are important public health measures among the elderly: prevention of transmission of infection; early identification of infected people and provision of preventive therapy; active search in order to make an early diagnosis; and early initiation of treatment.[14] In addition, these actions improve the training of health workers on signs and symptoms, including employees of long-term care facilities.

Considering the race/color variable, the results of the present study corroborate those of studies conducted in Brazil, in São Luís (Maranhão)[15] and in Campo Grande (Mato Grosso do Sul)[16], where most deaths occurred in individuals of mixed race and similar to the distribution of TB incidence in Brazil[17]. Regarding marital status, more

than 40% of deaths occurred among single individuals, in line with other studies.[15,16]

Data analysis showed higher mortality in individuals with up to eight years of study, and data found in the present study were in agreement with studies conducted by Santos-Neto[15], Espíndula[16], Lindoso[12] and Siqueira[7], who reported illiteracy or low education in less financially privileged situations as risk factors for incidence and mortality from TB.[18,19]

Low educational level can contribute to unfavorable living conditions such as less knowledge and perception of health, less self-care, and late search for health services that increase vulnerability to TB. These aspects are responsible for a higher incidence of the disease and contribute to non-adherence to treatment, which influence the occurrence of death.[12, 15, 16, 20]

As for the place of occurrence of deaths registered in Brazil, 80.06% died in the hospital. Between 2008 and 2012, in the urban area of São Luís (Maranhão), most deaths of pulmonary TB (74%) occurred in hospitals,[15] as occurred in the city of São Paulo (86%) in 2002.[12]

Most TB deaths identified in this study refer to pulmonary TB, which represents the main transmissible form of the disease. This scenario is like that found in other national studies, such as those by Espíndola[20] in Campo Grande (84.5% of cases) and Siqueira[7] in Porto Velho (78% of cases). Since pulmonary TB is considered as easy to diagnose and of low cost, it is expected that it can be performed at the primary level of care in health services.

Several aspects must be considered in the persistent scenario of TB and death from it, among which the permanent condition of poverty of a large part of the population, the difficulty of accessing health services and the weakness of disease control programs, in addition to individual biological issues.

Considering the access to health services, the priorities of the Family Health Strategy (FHS) are the prevention, promotion and recovery of people's health in an integral and longitudinal manner. This is a strategy for expansion, qualification and consolidation of primary care because it favors the reorientation of the work process with greater potential to deepen the principles, guidelines and foundations of primary care; expand the resolution and impact on the health situation of people and communities; and provide an important cost-effectiveness ratio. The strategy is based on the principles of the Brazilian health reform and becomes the focus of the reorganization of primary care by guaranteeing service provision and strengthening SUS principles of universality, accessibility, integrality and equity.[21]

Rates of TB mortality have declined in Brazil; in 2003, it was 2.8 deaths for each group of 100 thousand inhabitants, and in 2003, the rate was 2.3 (BRASIL, 2015a). In the present study, was found a rate of 2.7 per 100 thousand inhabitants for the period, with a decrease from 2001 (3.2 per 100 thousand) to 2011 (2.4 per 100 thousand) and in line with the evolution of TB mortality described in other studies.[22]

In 2011 and before the established deadline, Brazil reached one of the goals of the Millennium Development Goals, which was the reduction of the mortality rate in 1990 by 50%.[1] Despite this fact, marked regional differences are observed, especially for the southeast, north and northeast regions, which have rates above the national average, as also observed in the present study.

Worldwide, the TB mortality rate fell by 47% between 1990 and 2015. Most Western European countries, Canada, the United States, Australia and New Zealand have <1 TB death per 100,000 inhabitants, in contrast with more than 40 cases per 100 inhabitants in much of the African Region, Afghanistan, Bangladesh, Cambodia, Indonesia and Myanmar.[1] In spite of the reduction in TB mortality rates in Brazil and worldwide, there is still a great need to expand actions aimed at reducing these deaths.

Most affected individuals were male, 40 years old or older, mixed race, single, with up to eight years of study, history of hospitalization and medical assistance and cases in which autopsy was not performed for diagnostic confirmation. Since this is a preventable event, knowing the profile of the population that dies and the places where deaths occur is essential for acting in primary care towards reducing deaths.

A complicator found in the development of the work was related to the quality of data in the studied database. The perception of professionals involved must be promoted regarding the importance of the work process related to data production and the performance of epidemiological surveillance.

Recognizing the dynamics of TB mortality should be used as a tool for the planning o prevention and control actions by municipal and state managers. For undergraduate teaching, promoting the perception of the importance of the work process related to data production and performance of epidemiological surveillance is essential. To this end, there is need for improvement of surveillance systems and early diagnosis of cases in order to reach specific groups identified as more vulnerable and the proposal of strategies differentiated by sex, age and schooling at the local level in TB control programs[1].

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AUTHORS' CONTRIBUTIONS

There was an effective participation of all the related authors in the work, being the conception and design of the study, analysis and interpretation of the data, writing, correction and final edition of the version to be published; making public its responsibility for the content presented.